

GRADE AND DRAIN CONSTRUCTION

63-07.0100 CLEARING AND GRUBBING

.0110 Right-of-Way Stakes - Prior to the start of the clearing and grubbing operations, the Project Engineer shall see that these right-of-way stakes along with other stakes such as centerline references, etc., are well guarded and flagged to be visible to equipment operators. Further information regarding the setting of these stakes is provided in Chapter 4 of this manual.

.0120 Clearing Limits - It is the intent that no clearing or grubbing be performed beyond clearing lines indicated on the roadway plans unless authorized by property owner consent release or otherwise directed by the Project Engineer. When clearing lines are not indicated on the plans, the Project Engineer shall establish the limits of clearing and grubbing necessary based on the cross sections and slope stakes. The clearing lines indicated on the plans or established by the Project Engineer should allow sufficient work space beyond the slope stake lines to properly construct and final dress the slopes, ditches, etc. Areas between the clearing line and the right-of-way lines should be left in an undisturbed condition, if possible. The Project Engineer shall mark all trees, shrubs, structures, or other items that are not to be disturbed by the clearing operations.

The Project Engineer shall confirm the adequacy of the clearing lines, and as near as possible, verify its accuracy and compatibility with the cross sections.

It is the Project Engineer's responsibility to limit the exposed erodible soil resulting from the clearing and grubbing operations to that area allowed by the Specifications. The Project Engineer and the Contractor will meet to locate predisturbance BMP's. These BMP measures are to be installed prior to clearing and grubbing operations in all locations practical. This subject is discussed in detail in Chapter 5 of this manual and should be reviewed closely.

The confinement of clearing and grubbing within the clearing lines, the need for and extent of clearing selected areas beyond these lines, and the scheduling of clearing limits for environmental control are items which should be discussed and clarified at the pre-construction conference.

.0121 Pay Item - Normally Clearing and Grubbing is paid as a Lump Sum with a unit of one. The number of acres involved in this Lump Sum will be found in the General Summary in the front of the plans. This pay item is not effected by the clearing limits unless noted in the plans or unless the Project Engineer makes authorized adjustments.

.0122 Grass Fields - On occasion, the clearing and grubbing limits extend across

cleared fields that are covered by an existing stand of grass. It is undesirable to disturb this grass any more than necessary. The Project Engineer should limit the disturbed area to the minimum necessary to construct the road. If in doubt as to the suitability of the grass for right-of-way purposes, the Project Engineer should check with the District Construction Office who may in turn consult the Division of Construction Landscape Architect.

.0130 Progress Pay Estimate - After an area has been cleared and grubbed to the satisfaction of the Project Engineer, the Project Engineer shall measure the satisfactory area and pay the Lump Sum item as a percentage of the clearing limit area found in the General Summary. The total Lump Sum item paid shall not exceed 1.0 unless the Project Engineer has made authorized adjustments for overrun.

.0131 Increase Quantities - In the event it becomes necessary to increase the Clearing and Grubbing acreage because of a slide or other authorized change, the Project Engineer should be familiar with the following procedure:

In accordance with Section 202.05 of the Standard Specifications, changes in payment for Clearing and Grubbing, because of approved plan changes, will be computed at a unit price based on the Lump Sum bid divided by the total estimated area of Clearing and Grubbing shown on the original plans.

1. The change order shall show the basic calculations for this procedure as part of the explanation and should also include reference to the above mentioned specification.
2. The original lump sum and bid price of Clearing and Grubbing shall be included in the change order as a Decrease
3. The new lump sum and the revised price which includes the total of the original bid price plus the computed cost for the additional acreage shall be included in the change order as a Supplemental Item Increase.

The net effect is to increase the original lump sum price of the Clearing and Grubbing Item by the amount of the increased acreage multiplied by the amount bid per acre. This procedure may also be followed for subsequent adjustments; however, you must use the adjusted total acreage and price from the previous change order to make the calculations in lieu of the original price and acreage.

63-07.0200 ROADWAY AND DRAINAGE EXCAVATION

Roadway and drainage excavation consists of the removal and satisfactory disposal of all materials taken from within the limits of the work contracted, lying between the original ground line and the excavation limits established or approved by the Engineer as shown on the final cross sections. Prior to beginning excavation operations, proper disposal of all clearing and

grubbing debris must be completed, particularly if the excavation is for the purpose of embankment construction.

.0210 Slope Stakes - Prior to starting excavation, slope stakes should be set at fifty foot intervals to conform to the required typical section as provided for on the plans. It may become necessary to vary the slopes depending upon the nature of the materials encountered or to accommodate for slides that may occur. When contract staking is involved, no slope changes are to be made without the approval of the Project Engineer. Refer to Chapter 4 on Construction Surveying for additional information.

.0220 Soil Profile - If the plans provide a soil profile, the Project Engineer should review the recommendations carefully and see that they are followed. The Project Engineer should notify the District Construction Office immediately upon encountering soil conditions that vary greatly from the information shown on the soil profile. Most plans designate the types of soil that are suitable for use as top fills or refill material. They also identify soft or unstable areas and provide for the distribution of any available rock to these sites. Every effort should be made to conserve the rock material for this purpose. The Project Engineer should review the soil profile with the Contractor's representative and be sure that they are well aware of any special requirements. In addition, the Project Engineer should monitor the day-to-day excavation and embankment operation closely to insure proper compliance with all applicable plan notes.

.0221 Cut Stability Sections - Most grade and drain plans that have a significant amount of excavation will have Cut Stability Sections that follow immediately after the Soil Profile. These sections portray the cut slopes and relate the various rock elevations, as determined by coring, visual inspection, or other methods, to the prescribed benching. Generally, each cut will have several such sections shown and the information is very helpful. The Project Engineer should review the sections closely and check with the Contractor's representative to insure that the Contractor is knowledgeable of these sections and that they are performing the excavation accordingly. The Contractor's staking party should be aware of these sections and utilize them to determine their pre-splitting stakes.

.0230 Rock Excavation - Care should be exercised in rock excavation to prevent overshooting and excessive breakage. Final slopes shall be shaped to the established template with no deviation readily discernible from the roadway. It is very important that all loose or fractured rock be removed from the rock slope.

.0231 Roadbed Excavation - When rock is encountered in roadbed excavation, it must be removed from the sub-grade to the required depth below the finished grade. The final surface of the rock excavation shall be left in such condition that complete drainage of the sub-grade will be accomplished. No holes or

pockets will be tolerated. The Project Engineer should inspect the rock surface prior to refilling to determine if sub-surface water will be discharged into the sub-grade. Any necessary corrective action should be performed prior to placing refill materials. Sufficient elevation checks should be taken throughout the cut to be assured that the rock removal meets the required depth.

.0232 Pre-splitting - When pre-splitting, it is desirable to obtain smooth rock faces in the rock or shale formations. The Project Engineer should spot check the Contractor's blasting operation to ensure that the Contractor is following applicable local, state, federal, and project specific guidelines for blasting. The Project Engineer is not expected to be an expert on blasting. Any questions concerning Pre-splitting and production blasting should be directed to the District Construction Office. The District Construction Office may contact the Central Office Construction Liaison for further guidance. Generally, limestone and sandstone pre-splitting holes should be spaced from 24 inches to 36 inches and shale from 24 inches to 30 inches. Overshooting and undershooting conditions are undesirable and should be held to a minimum.

.0233 Rock Adjacent to Structures - In areas where rock excavation is adjacent to structures and shooting is required, precautions should be taken to perform the shooting. If possible, the shooting should be completed prior to placing concrete in the structure. In many instances, structures have been damaged as a result of shooting in adjacent areas. Damages, which are not readily discernible, often occur as a result of shooting near these structures.

.0240 Borrow Excavation - Unless otherwise provided on the plans, the Contractor shall obtain sites for borrow pits outside of the right-of-way limits at his own expense. All borrow shall be obtained from sites approved by the Engineer. Refer to Section 205.03 in the Standard Specifications.

When borrow is required, the Project Engineer should check the plans and proposal for hydraulic analysis requirements. If the Project Engineer has any questions, they should contact the District Construction Office.

These requirements apply equally regardless of whether borrow is a bid item or utilized as embankment-in-place.

.0241 Proposed Borrow Site - If the Contractor is required to provide borrow sites, they will submit plans of the proposed borrow site accompanied with a request for review and approval by the Project Engineer. The plans and written request shall contain, but not necessarily be limited to, the following information:

1. *Plan, Profile and Cross-Sections
 - a. Original and final elevations.
 - b. Proposed erosion & pollution controls.
 1. While pit is operational.
 2. Final condition.
 - c. Existing topography and drainage.

*Plans, profile, and cross sections should be scaled drawings submitted on standard size reproducible plan sheets and should contain enough detail to show the configuration of the area upon completion of the borrow operations.

2. Written agreement with property owner.
 - a. If the property owner has any preference in seed mixture for the site, it should be designated in writing.
 - b. No permission will be granted for the property owner to do his own seeding.
3. Approval of the Division of Water Resources of the Department of Natural Resources and Environmental Protection and if streams or floodways are affected.
4. Approval of other regulatory agencies when applicable such as, but not limited to US Forest Service, US Army Corps of Engineers, US Coast Guard, and Local Planning and Zoning Commissions.
5. Approval of utility owners when overhead, on-ground or underground utilities are involved.
6. Archaeological clearance of the proposed site. This may not be necessary if the site has been recently disturbed.

.0242 Review of Borrow Site Proposal - When a borrow site proposal has been received by the Project Engineer, they should make an on-site inspection and consider the following:

1. The effect of drainage to public and private property.
2. The before and after aesthetics of the borrow site area.
3. Compliance of the proposal with the Specifications, Plans, and good construction practices.

Other requirements of Borrow Site Areas:

1. Approval of Soils - Sufficient soil samples must be taken to accurately determine the quality of the material in the borrow pit. It is suggested that a minimum of one test hole per acre be excavated to a depth equal to, if not deeper than, the final grade proposed by the Contractor. Soil samples should then be taken from each soil horizon recording the sample depth, soil layer thickness, and location in a field book. Sampling a borrow site in this manner will not only determine the quality of the soils in the site, but will also provide information to be utilized in future density tests. The Contractor is responsible for providing access to the borrow site and the necessary excavation to enable the Project Engineer to obtain sufficient samples.
2. Borrow pit slopes should be left flat enough to minimize erosion.
3. An undisturbed buffer zone should be left in areas where the borrow pit borders on a property line.

.0250 Waste - No excavated material shall be wasted without permission. The Project Engineer should first consider how to best utilize excess material to benefit the roadway on projects with roadway excavation in excess of that required for normal embankment construction. They should review the plans closely with emphasis on embankment slopes and available right-of-way. Whenever possible they should flatten slopes and fill depressions, gullies, etc. In doing so, the Project Engineer may find it necessary to lengthen or raise drainage pipes, change flow lines, and/or install drainage boxes. The Project Engineer should review the proposed changes with the District Construction Office, particularly if changes in contract pay items are involved. Refer to Article 204.03.08 & 204.04.09 of the Standard Specifications.

The advantages of utilizing excess material in this manner are significant. Roadway safety can be greatly improved by flattening slopes and decreasing or eliminating the need for guardrail, problems from erosion can be decreased, fills can be made more stable, and future maintenance requirements minimized.

Any location whether inside or outside the limits of the right-of-way should be avoided as a waste site if the additional loading of the proposed waste could result in a slide. The Project Engineer should check the plans and proposal for hydraulic analysis requirements and contact the District Construction Office if they have any questions.

.0251 Proposed Waste Site - If the plans or proposal requires the Contractor to provide waste areas, they will submit plans of the proposed waste site accompanied with a request for review and approval by the Engineer. The plans and written request shall contain, but not necessarily be limited to, the

following information:

1. *Plan, profile, and cross-sections or contours
 - a. Original and final elevations.
 - b. Sub-surface type and rock line, when applicable.
 - c. Any preparatory work such as, but not limited to, benching and sub-drainage.
 - d. Any necessary data to assure foundation and slope stability.
 - e. Existing topography and drainage.
 - f. Proposed erosion and pollution controls.

*Plan, profile and cross-sections should be scaled drawings, submitted on standard-size reproducible plan sheets and should contain enough detail to show the configuration of the original ground and the anticipated configuration of the area upon completion of the waste operations.

2. Written agreement with the property owner.
 - a. If the property owner has any preference in seed mixture for the site, it should be designated in writing.
 - b. No permission will be granted for the property owner to do his own seeding.
3. Approval of the Division of Water Resources of the Department of Natural Resources and Environmental Protection if streams or floodways are effected.
4. Approval of other regulatory agencies when applicable, such as, but not limited to, US Forest Service, US Army Corps of Engineers, US Coast Guard, and Local Planning and Zoning Commissions.
5. Approval of utility owners when overhead, on-ground, or underground utilities are involved.
6. Submission of a geotechnical investigation report. This is the Contractor's responsibility and expense. they shall engage a prequalified engineering consultant, approved by the Department, when required to submit this report.
 - a. Names of prequalified geotechnical consultants may be obtained from the Division of Material's Geotechnical Section through the Division of Construction

.0252 Review of Waste Site Proposal - When the Project Engineer has received a waste site proposal, they should make an on-site inspection and consider the following:

1. The effect of drainage to public and private property.
2. The before and after aesthetics of the waste area site.
3. The consequences of foundation failures or slides that would affect public or private property.

Other requirements for waste sites are:

1. Waste sites adjacent to roadway embankments should be constructed at an elevation below the embankment shoulder.
2. Any waste, placed within the right-of-way and incorporated in the construction should be placed and compacted in the same manner as the embankment.
3. The placement of waste should not overload sewers, pipelines, and other structures.
4. The waste should not be placed around utility poles or over gas lines without the Contractor obtaining an agreement from the utility company releasing the Department from responsibility.

.0260 Waste or Borrow Site Approval – Compiling this information is a time consuming process and, unless promptly acted on by the Contractor, could result in a delay in access to the waste or borrow material. Soil samples should be taken as early as practical after the Contract is awarded for borrow sites. The possibility always exists that the soils will not meet the requirements and another borrow site will have to be selected. The requirements of the waste and/or borrow section should be reviewed with the Contractor at the Pre-Construction Conference.

When the Project Engineer is satisfied with the Contractor's proposal, they will transmit the proposal along with his recommendations to the District Construction Office for review.

The District Branch Manager for Construction or his delegated representative shall then review the proposal and, if necessary, inspect the proposed site. When the District representative is satisfied with the Contractor's proposal, they shall make written approval of the request outlining the conditions of approval. However, if any of the following conditions exist, the District will submit the waste or borrow proposal along with recommendations and comments to the Division of Construction Central Office for further review and/or approval:

1. Proposed waste or borrow sites involve massive amounts of material (100,000 C.Y. or more).

- a. This requirement also applies if a site starts out at less than 100,000 C.Y., but is later modified to include more than 100,000 C.Y.
2. Locations where a question of foundation or slope stability exists.
3. Locations where health, welfare and life may be adversely affected.
4. Locations where public or private property may be adversely affected.
5. Locations where large environmental impacts are imminent.

.0261 Addresses of Involved Agencies - The following is a list of addresses of various agencies that may be involved in the acquisition of waste or borrow sites depending on location.

Department of Natural Resources and Environmental Protection
Ash Building
14 Reilly Road
Frankfort, Kentucky 40601
Phone: (502) 564-3410

US Army Engineer District, Huntington
502 8th Street
Huntington, WV 25701-2070
Phone: (304) 399-5395

US Army Corps of Engineers, Louisville,
P.O. Box 59
Louisville, KY 40201-0059
Phone: (502) 315-6102

US Army Corps of Engineers, Nashville
P.O. Box 1070
Nashville, Tennessee 37202-1070
Phone: (615) 736-5626
US Army Corps of Engineers, St. Louis
1222 Spruce Street
St. Louis, MO 63103-2833
Phone: (314) 331-8010

United States Coast Guard
Commander (aon)
Eighth Coast Guard District

Hale Boggs Federal Building
500 Poydras Street
New Orleans, LA 70130
Phone (504) 671-2268

.0270 Progress Pay Estimates - Procedures for the compilation of quantities for progress pay estimates are provided in Chapter 4 on Construction Surveying.

63-07.0300 EMBANKMENT CONSTRUCTION

Refer to Section 206, titled Embankment of the Standard Specifications.

Rock, as used in embankment construction, is defined as unweathered limestone, durable shale (SDI ≥ 95 by KM 64-513), or durable sandstone. Any reference to Rock refers to these type materials. SDI is the acronym for "Slake Durability Index".

Earth or soils, as used in roadway embankments, includes earth, nondurable shale (SDI < 95 by KM 64-513), friable sandstone, weathered rock, waste crushed aggregate, bank gravel, creek gravel or similar materials. Unless otherwise specified in the project plans, compaction shall be as specified in Section 206.03 of the Standard Specifications.

Shale is considered to be soil or soil-like in all circumstances unless it is tested and found to have an SDI ≥ 95 . Shale formations may have a tendency to change properties as the location in the formation changes. Shale shown in the soil-profile sheets as being durable with an SDI ≥ 95 may be used as rock initially but should be sampled and tested frequently for confirmation. Failing this test, it shall be treated as soil.

.0310 Earth Embankment - Prior to the construction of an embankment, the area that will serve as its foundation should be carefully inspected. All areas of questionable supporting capacity and poor drainage should be given special attention.

The presence of soft or very wet conditions may suggest the need for removal of unstable material, installation of sub-surface drainage facilities to remove spring or seepage water, or the need for aeration to dry the material. The Project Engineer should always be on the alert to detect conditions of this type. Certain cases require mechanical or chemical stabilization of the area. The Geotechnical Branch should evaluate these areas and make necessary recommendations.

.0311 Unstable Areas - Embankments to be placed over swampy or other unstable areas which will not support the weight of the hauling equipment may, when indicated on the plans or directed by the Project Engineer, be constructed by end-dumping or otherwise depositing successive loads behind the leading edge of the lift and blading the material into place. This process is called "Bridging" and is used to develop a working platform for fill construction.

Rock or granular material should always be used for this operation, when available. Under no conditions should a material be utilized for bridging that is above optimum moisture. This initial lift should have sufficient thickness capable of supporting the hauling equipment without pumping or heaving, but should not exceed three feet unless indicated on the plans or directed by the Project Engineer. The original ground will retain a certain amount of inherent stability when not disturbed by heavy equipment or when allowed to stabilize over a lengthy period after having been subjected to heavy equipment. The Project Engineer should recognize this fact and require the contractor to minimize his equipment usage in areas of questionable stability until the embankment is well established. If the stability is critical, the Project Engineer may eliminate the removal of sod over the area to preserve the natural ground stability.

- .0312 Water Table** - When constructing an embankment across flat or level land, special ditches should always be excavated on both sides of the fill area before the embankment is started. If conditions require it, perforated pipe and/or filter fabric may be used in the original ground under the embankment location in conjunction with the ditches. The effect of this type installation would be to lower the water table and increase the stability of the natural ground.
- .0313 Steep Slopes** - In constructing embankments on slopes with grades of 15% or steeper, particular attention should be given to obtaining a good interlock between the sloping foundation and the new embankment. Steps with horizontal and vertical faces should be cut in the original slope as the embankment is brought up in layers. Many times areas of steep embankment will require benching as a pay item. Refer to applicable plan sheets, Standard Specifications and Standard Drawings for more information. Original ground on a slope of less than 15% should be loosened to a depth of six inches and compacted in accordance with the requirements for compaction as prescribed for the project.
- .0314 General** - The inspector must not permit any undesirable material to be incorporated in the embankment. This can be interpreted as logs, roots, stumps, etc. In addition, the inspector must be fully aware of any formations that are designated by the plans to be wasted such as coal, coal bloom, etc.

Construction hauling over fills should not be confined to the same path or track but should be spread out over the entire width of the embankment to avoid ruts and areas of non-uniform compaction. During earth embankment construction, if any part of the roadway loses density or becomes unstable under the action of the Contractor's equipment, that section must be recompacted. As applicable, the addition of moisture or aeration to remove moisture may be required to obtain density. It may be necessary to remove

the material entirely and replace it with material that can be compacted to the required density. It is important to note that heavy vibrations may wick water to the surface, causing an unstable area. In many cases, when the vibrations have ceased for a period of time, the water will return to the natural water level and the embankment material will regain its structural integrity.

At the end of each day's work, the surface of the embankment should be compacted, graded, and crowned to allow runoff of rain water. Should it then rain on the fill before work resumes, the amount of water soaked or trapped in the fill would be minimized and the stability of the fill would be maintained as much as possible.

- .0315 Special Shale Embankment** - The project plans may include specific instructions, usually in the Geotechnical Notes or Soil Profile Sheets, requiring special construction procedures for soil-like shales that are more restrictive than normal compaction procedures. The notes may require soil-like shales to be constructed in lifts less than twelve inches, the addition of considerable water, special handling and compaction procedures, and the use of specific equipment. When included in the plans, these requirements shall be followed closely paying attention to all details. Sufficient water has been found to be critical in this procedure and the closer to optimum (or even above) the better for slaking and quicker compaction to meet the requirements.
- .0320 Rock Embankment** - A rock embankment is considered to be an embankment constructed principally of unweathered limestone, durable shale (SDI \geq 95 by KM 64-513), or durable sandstone. A rock embankment shall be constructed in layers with the thickness of each layer or lift not to exceed three feet. The thickness of the lift is controlled by the dimensions of the dominant rock size. Each lift shall be constructed by rock dumped on the preceding lift that is then pushed or dozed over the face of the lift in such a manner as to insure that the action of dozing should fill all voids and eliminate bridging the broken rock in the lift. A rock fill constructed in this manner does not normally require rolling.

When a rock and shale or a rock and soil mixture is utilized to construct a fill, each lift shall be limited to twelve inches unless the mixture is composed primarily of rock larger than twelve inches. In this case, the thickness of the lift may be increased to that of the rock size up to a maximum of three feet. Compaction is required in this operation, but the amount of rock in the mixture (rock $>$ 60%) may eliminate the density test requirement.

When rock and soil and/or shale are available on a project, every effort should be made to schedule the excavation procedures so that the rock would be available to stabilize the original ground when starting the fill, particularly in soft or wet areas.

.0330 Subgrade - The Project Engineer shall insure that the materials incorporated into subgrade construction meet the plans and specification requirements for select CBR (California Bearing Ratio) material or rock subgrade. In addition, they shall see that the subgrade is checked for compliance with specification tolerances and density requirements and that all areas of soft and yielding subgrade are corrected.

.0340 Embankment-in-Place - When Embankment-in-Place is specified on the plans or in the proposal, all construction requirements of the Standard Specifications shall apply except those stipulated in Section 207.08. The final pay quantity of Embankment-in-Place will be the design quantity as stipulated in Section 204.00.01 of the Specifications. Unless otherwise stipulated in the plans or proposal notes, the Specification requirements regarding either waste or borrow sites apply fully to Embankment-in-Place construction with the exception that cross-sections for the purpose of computing quantities are not necessary for borrow pits.

63-07.0400 HAUL ROADS

Haul roads are normally constructed by the Contractor to provide a road for his equipment to use to gain access to the work site.

When haul roads are built within the planned roadway limits, all construction should be in accordance with the Standard Specifications for Embankment Construction, Section 206. If the grade of the haul roads will be near that of the design grade, construction of the roadway to a partial width for haul road purposes should not be permitted.

When a haul road extends off the right-of-way, the Project Engineer should pay close attention to the drainage. If borrow or waste sites are involved, the Contractor's plans should show the haul road(s) and drainage.

If the haul road involves the traveling public, the Project Engineer should pay special attention to the construction of warning signs and require the use of flag persons if necessary. Sight distances of the approaching motorists should also be a point of consideration.

Unless otherwise required or permitted, when haul roads are no longer being used they should be site graded and reseeded at the Contractor's expense to the satisfaction of the Engineer.

63-07.0500 DESIGN QUANTITIES

Section 204.04.01 of the Standard Specifications provides for payment of earthwork to be based on design quantities.

When a Project Engineer is assigned a project with payment of earthwork based on design

quantities, they do not have to cross-section and compute the entire roadway excavation.

.0510 Check Sections - Final check sections shall be taken in cuts to substantiate that the slopes have been constructed within the tolerances specified by Section 204.03.10 of the Specifications. The frequency should average one section per 500 feet of cut along the centerline of survey with a minimum of one section per cut. When Embankment-in-Place is specified, this requirement also applies to fills. These sections are to be plotted on the as-built plans to be submitted with the final estimate and are to become part of the project record. Elevations are to be taken in rock cuts to substantiate excavation to the template refill line.

.0520 Authorized Excavation

.0521 Field measurements - Field measurements must be taken on embankment benching, undercutting, and/or slides to calculate yardage for payment of authorized adjustments. In addition, field measurements must be paid on authorized excavation not included on the plans such as ditches, and private entrances.

A. Benching quantities are not part of the Design Quantities and are considered Authorized Adjustments to Design Quantities of Roadway Excavation or Embankment-In-Place and must be calculated from field measurements (See Section 204.04.02 of the Standard Specifications). They are not to be paid as plan or design quantity.

.0522 Cut Slopes - Authorized changes in cut slopes shall be paid to the revised plan template.

When slope changes are made, the revised slopes shall be drawn on the design cross-section sheets to become the new design slope with additional (or subtractive) quantities computed therefrom and classified as "Authorized Adjustments." Utilize only the new areas in the computations and do not involve the original design quantities. Whenever authorized adjustments of any type are made, the Project Engineer should get them plotted and the yardage calculated as soon as possible.

.0523 Change Orders - Whenever a change order is necessary to authorize an increase in roadway excavation on a design quantity project, include a brief but concise description of the change in work and the quantity changed. Make efforts to be as accurate as possible.

.0524 Unauthorized Excavation - No payment will be made for unauthorized excavation.

63-07.0600 PRECAST SMALL DRAINAGE STRUCTURES

See Section 710.03.01 of the Standard Specifications for additional information pertaining to installation and materials.

Shop drawings are not required and will not be accepted for consideration for State Wide Approval for those structures, such as manholes, which Standard Drawings customarily permit the use of precast components. Similarly, some standard drawings contain specific requirements pertaining to cast-in-place structures and these notes will govern in all cases unless a specific variance is approved.

.0610 Criteria For Payment - The Project Engineer shall use the same criteria for payment of precast drainage units as would be used for cast-in-place units. There is no requirement that an "order" be placed for precast units any more so than there is for cast-in-place units. Unanticipated job conditions that affect precast units are considered the Contractor's responsibility even if the unit is on the jobsite. The Project Engineer has full latitude to make any changes on the project, these changes include revising flow lines or eliminating items. There is no obligation for payment of these changes unless the precast unit has been installed. The consideration for payment of a precast unit after installation is similar to that for cast-in-place units, as is the procedure for removal and replacement if necessary.

.0611 Stockpile Payment - Precast small drainage structures are not eligible for payment as "Stockpile Items." Precast units, either included in the contract as specific bid items or specified historically by the Department's Standard Drawings, do qualify for consideration for stockpile payment as permitted by the Standard Specifications.

.0612 Approved Drawing - An approved drawing must be on file for any unit to qualify for payment.

.0620 Acceptance of Unit - A representative from the District Material Engineer's office of the district where the fabrication plant is located will normally perform the necessary fabrication inspections at the plant. The DME's office must be informed of the fabrication two weeks prior to the fabrication. If this fabrication plant inspection is satisfactory, the Materials inspector will affix an approval stamp to each unit prior to shipment to the jobsite. This stamp must be in place before the Project Engineer will accept the unit for installation on the project. However, the existence of this stamp does not mean the Project Engineer will automatically accept the unit. The unit must be in satisfactory physical condition, of a proper size and configuration for the specified location and, in general, be installed in a satisfactory manner before it is acceptable at the job site.

.0630 Approved Drawings - Precast small drainage structures shall be in substantial conformance with approved drawings. The latitude to adapt Standard Drawings

to various conditions in the field utilizing cast-in-place methods does not exist for pre-cast units. If a manufacturer needs to construct a precast unit to accept skewed pipe, multiple pipe openings or other variations, an approved drawing reflecting the modifications must be on record. There are two procedures for submission of drawings for approval. The primary procedure is Statewide Approval and the secondary procedure is Project Specific Approval. Both procedures are discussed in detail in Exhibit 63-7-1. The Project Engineer should have an approved drawing in his files consisting of either a statewide drawing or a project specific drawing for every precast small drainage structure used in lieu of a cast-in-place unit. An approved drawing must be stamped, signed, and dated by an Engineer in the Division of Construction.

- .0631 Statewide Approval** - In this procedure, the manufacturer obtains approval, as indicated by a stamp affixed to the drawing, from the Division of Construction. The Division of Materials distributes copies of the approved drawing to all Project Engineers, Materials Engineers, and others on a statewide basis.
- .0632 Project Specific Approval** - This procedure was devised to meet a specific design need on a particular project. The Contractor submits the drawing for this type of approval to the Project Engineer who forwards it to the District Construction Office for review, and then on to the Division of Construction, Central Office. If approved, the Central Office Division of Construction will affix an approval stamp to the drawing. Approval of a particular drawing for a specific project does not imply its approval for use on other projects. This procedure must be followed on each project.
- .0640 Exhibit No. 63-7-1** - This exhibit follows this chapter and includes guidance to the designer, manufacturer, and the Project Engineer. It goes into the detail on the subject of Small Precast Drainage Structures more comprehensively than this article. This exhibit was included in this manner to facilitate the copying and distribution of the information to inspectors, fabricators and other interested parties.

TABLE OF EXHIBITS

CHAPTER SEVEN

TITLE

EXHIBIT NUMBER

Precast Small Drainage Structures - Guidelines for Preparation
of Shop Drawings and Inspection of Units

63-7-1

Precast Small Drainage Structure - Fabrication Limits

63-7-2

PRECAST SMALL DRAINAGE STRUCTURES GUIDELINES FOR PREPARATION OF SHOP DRAWINGS AND INSPECTION OF UNITS

General Information Shop drawings should be prepared with care and attention to details since they must contain directions not only for fabrication of the structure in the shop, but also for installation in the field when appropriate. It is anticipated that they will be used by both the contractor and the state inspectors in the field installation process as well as by the manufacturer and the plant inspector in the fabrication process. These drawings will be used as supplements to the applicable Standard Drawings and not on a stand-alone basis. As such, any components of the Standard Drawings which remain unchanged need not be addressed. This includes such items as grills, grates, etc.

Shop drawings are not required nor will they be accepted for consideration for those structures, such as manholes, which the Standard Drawings customarily permit the use of precast components. Similarly, some standard drawings contain specific requirements pertaining to cast-in-place requirements and these notes will govern in all cases.

The manufacturer has full responsibility for the integrity, content and quality of his shop drawings. These drawings must be checked and approved by the Division of Construction before they may be used to fabricate units for project installation. This check is directed at dimensions, as compared to Standard Drawings, the location of reinforcing steel, applicable notes and the overall practicality of the drawings. This check and approval process does not relieve the manufacturer of his responsibilities regarding the drawings or the units subsequently fabricated from the drawings. The Division of Construction will apply an approval stamp to all approved drawings. All drawings used in the fabrication and inspection of the structures, either in the plant or at the job site, must have this stamp.

A representative from the District Material Engineer's office, in whose area the fabrication plant is located, will normally perform the necessary fabrication inspections at the plant. The procedures for this inspection are outlined elsewhere and will not be discussed herein. If this plant fabrication inspection is satisfactory, the Materials Inspector will affix an approval stamp to each individual unit prior to shipment to the job site. This stamp must be in place before the Project Engineer will accept the unit for installation on the project. On the other hand, the existence of this stamp does not mean automatic acceptance by the Project Engineer. The unit must be in satisfactory physical condition, of a proper size and configuration for the specified location and, in general, installed in a satisfactory manner before it is acceptable at the job site.

The Project Engineer shall use the same criteria for payment of a precast drainage unit as would be used for a cast-in-place unit. There is no requirement that an "order" be placed for precast units any more so than there is for cast-in-place units. Unanticipated job conditions that affect a precast unit are considered to be the contractor's responsibility even if the unit is on the job. The Project Engineer has full latitude to make any changes on the project, including revising flow lines or eliminating items, up until the precast unit is installed without being obligated for payment. The consideration for payment of a precast unit, after installation, is similar to that for cast-in-place units as is the procedure for removal and replacement, if necessary. Precast units are not eligible for payment as "Stockpile Items" any more so than cast-in-place units.

Precast small drainage structures shall be in substantial conformance with approved drawings. The latitude to adapt Standard Drawings to various conditions in the field utilizing cast-in-place methods does not exist for precast units. If a manufacturer needs to construct a precast unit to accept skewed pipe, multiple pipe openings or other variations, an approved drawing reflecting the modifications must be on record.

The Department accepts no responsibility for notification to the manufacturer of changes in Standard Drawings that might affect existing approved shop drawings. The Standard Drawings listed by the plans as applying to the project and/or current standards in use at the time the project is let to construction shall govern over approved shop drawings.

1. Drawing Numbers

The drawings shall have a uniform numbering system for convenient identification. The following procedure is suggested:

- a. Create a prefix consisting of not more than two letters taken from the manufacturer's name followed by the applicable standard drawing prefix (*i.e.*, CRDP-010 or KPRDP-010 where the "C" stands for Cloud or the "KP" stands for Kentucky Precast.)
- b. The number should be the same as the applicable Standard Drawing. If the shop drawing includes more than one Standard Drawing (*i.e.*, more than one number) assign one standard drawing number as the shop drawing number and explain in the drawing notes.

2. Drawing Notes

The following notes generally fit all applications and should, when applicable, be included on the drawings:

- a. This drawing to be used with applicable version of DOH Std. Drawing No. ??.
(*With this note, it is not necessary for the version no. such as 02 or 03 to be shown since it is subject to change.*)
- b. 2 inch Minimum Concrete Cover on all reinforcing steel.
- c. Section 710.03.02 of the *Standard Specifications for Road and Bridge Construction* applies to this structure. (*This specification covers the type of concrete and various aspects of precast structures so there is no need for repetition of these notes on the shop drawings.*)
- d. 3/4 inch chamfer on all exposed edges. (*To be included on those structure drawings with exposed concrete [i.e., headwalls, etc.]*)
- e. Approved non-shrinking grout shall be used to fill all voids and around pipe ends.
- f. Reinforcing steel bars to be tack welded at all intersections in accordance with Section 605.04 of the *Standard Specifications for Road and Bridge Construction*.

3. Drawing Size & Distribution

Standard plan size drawing film (i.e., 22" by 36") should be used for preparation of the shop drawings; however, if the manufacturer elects, 12" by 17 3/4" may be used providing the drawing can be depicted clearly. The standard size film, when used, will be reduced by the Department to 12" by 17 3/4" for distribution to the field offices. No other sizes will be permitted. This is the same size as reduced plans and is considered the optimum size to retain good readability and yet be handled easily. It is preferred that these drawings and any lettering be done in ink so as to reproduce clearly.

- a. The manufacturer is responsible for sending good, readable drawings on reproducible film (*normally millar or sepia*) in the required size to the Division of Construction for approval.
- b. The Division of Construction will have 140 copies of each approved drawing made for initial distribution. Copying cost is \$0.20 per sheet. This calculates to a charge of \$28.00 per set for 140 copies of each drawing. Additional copies will be made at the manufacturer's request for his use. The Department will make the copies and bill the manufacturer for the cost. These prices and quantities are subject to change without notice.
- c. The Division of Materials will make distribution of the drawings and will also maintain and distribute the List of Approved Drawings. Distribution will be made to the Divisions of Construction and Materials, all Project Engineers' offices, all District Construction and Materials offices and all active Construction Consultants' offices.
- d. The Division of Construction will retain all approved drawings used for making distribution copies in its files. It is anticipated that the manufacturer will retain the unapproved originals in his files to be used for future modifications.

4. Additional Requirements

- a. Pickup Points – Pickup points generally take the form of cast-in-place handler holes, inserts or wire embedded in the concrete. In the case of the handler holes or inserts, the holes shall be filled with non-shrinking grout as discussed in 2e above. When wire is used, it shall be a non-rusting type even when cut. Wire used for this purpose shall be cut off after placement of the unit except wire used in box tops may be left provided it does not interfere with construction of the structure or need to be removed for other reasons. Appropriate instructions for the applicable procedure shall be included in the drawing notes.
- b. Reinforcing Steel – Bar size may be increased and spacing may be decreased in the interest of providing additional strength for handling and shipping. Bars may not be rearranged simply for convenience of the fabricator.

It is acceptable to tack weld reinforcing steel in precast small drainage units. All drawings submitted by precasters for approval shall include the following note or one similar in nature "Reinforced steel bars to be tack welded at all intersections in accordance with Section 605.04 of the Standard Specifications."

- c. **Preformed Pipe Openings** – Varying wall thicknesses of drainage pipe have made it necessary that some design consideration be given to the preformed pipe opening so as to accommodate the particular pipe to be used by the contractor. In short, conflicts have been encountered with preformed pipe openings when the larger sized concrete pipe with thicker walls have been used. The outer diameter of the pipe, when included with the additional 3" diameter, results in the preformed opening intruding into the structure walls and/or insufficient concrete cover over the pipe. This situation is in conflict with the Department's standards and is not to be permitted. Shop drawings must either address this problem or the unit will be unacceptable when manufactured with these deficiencies. The following points must be kept in mind when preparing drawings for each structure. The last page of this exhibit portrays these limits in a drawing.

- The hole opening for the pipe will not be allowed to infringe on the wall thickness.
- At least 4" of concrete with adequate reinforcing steel must be provided above the top of the hole opening for the pipe.

- d. **Chamfer Edge** – It is acceptable for the edges of precast units to be struck with a rounded edging tool as opposed to the standard 3/4" chamfer. The rounded edge should have a minimum of 1/2" radius and be neat and workmanlike.

It is generally required that all exposed edges be chamfered; however, not all edges of precast units remain exposed. Curb box inlet tops, for instance, do not remain exposed when abutted by sidewalks. The installation of chamfer strips in portions of a structure to be abutted by concrete is not acceptable and units, thus, fabricated are not acceptable and must be replaced.

5. Project Specific Shop Drawings

The foregoing discussion has been directed primarily to statewide approval for small drainage structure shop drawings. This is the preferred method of handling shop drawings; however, there also exists a need for having a procedure whereby dedicated drawings may be submitted for approval to meet a specific project's needs. The following procedure is set forth:

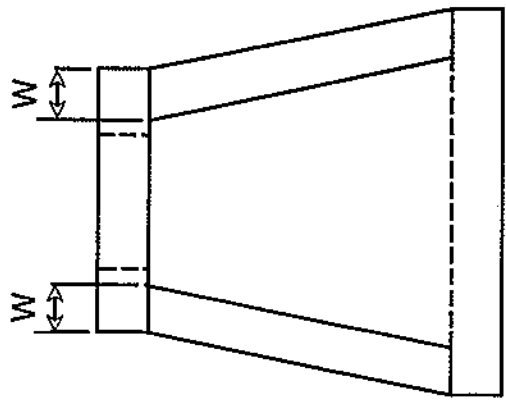
- a. **Shop Drawings** – Each drawing shall be identified by the county and project number. A minimum of six copies of each drawing should be submitted by the contractor to the Project Engineer along with a request for approval for use on the project. The drawing(s) may be any size (*minimum 8 1/2" by 11"*) depending on the nature of the drawing. They must also be clear, legible and capable of being reproduced. The Project Engineer will review the drawings and, when he is satisfied, forward five to the District Construction Office for review and submission to the Division of Construction for consideration of approval. If the Project Engineer or the District Office does not recommend approval of the drawing, it should so stated, including appropriate reasons, in the submittal.

- b. Distribution – Providing the drawing is approved, the Division of Construction will retain one copy of the approved drawing in the project files and return three copies to the District Construction Office where one copy will be retained and two copies returned to the Project Engineer. The Project Engineer will return one approved drawing to the contractor who will have the responsibility of making sufficient additional copies for distribution to the fabricator and the District Materials Engineer. The Project Engineer shall have an approved drawing in his project files for each small drainage structure not covered by the statewide drawings and the unit must have the D.M.E's approval stamp before the structure shall be permitted to be installed on the project.
- c. Limitations – Approval of a particular drawing for a specific project does not imply approval to use on other projects. This procedure must be followed on each project.
- d. Except for the differences noted in a, b and c above, all other requirements discussed in statewide approval shall apply to Project Specific Drawings.

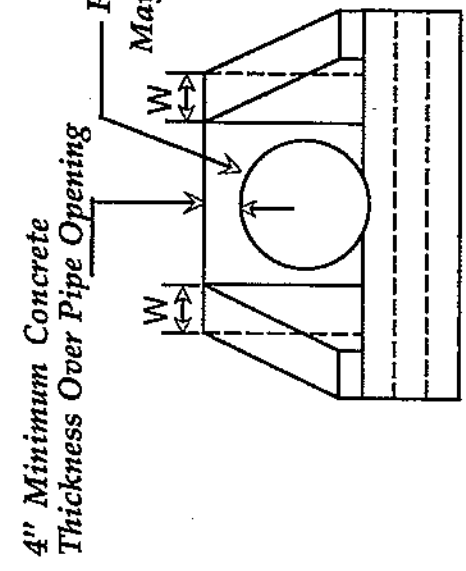
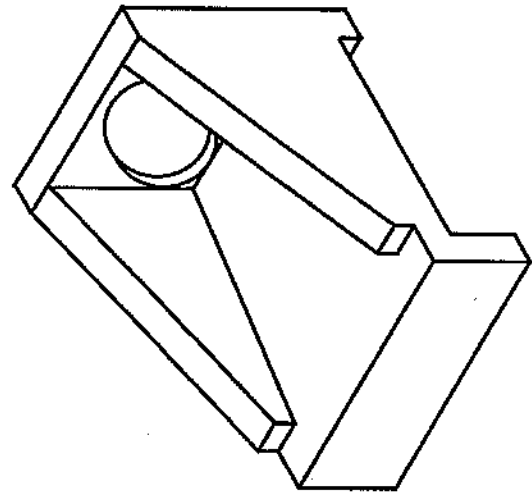
Prepared By The Division of Construction

PRECAST SMALL DRAINAGE STRUCTURE

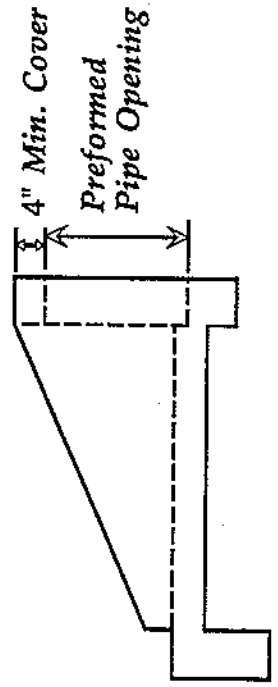
FABRICATION LIMITS



TOP VIEW



FRONT VIEW



SIDE VIEW